

EVALUATION OF HERBICIDE SPRAY APPLICATIONS TO SEEDLING EMOLOA
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Introduction

Previous research has shown that emoloa (*Eragrostis variabilis*) transplants could be treated with preemergence herbicides like Ronstar WP with little to no detrimental impact on subsequent growth. The time and cost of producing transplants could be avoided if effective chemical weed control tools were identified in direct seeded plantings of emoloa. Three herbicides were selected for this field demonstration. Buctril is label for seedling broadleaf weed control in newly seeded grasses grown for seed or sod production. Another herbicide selected for this study is new formulation of oxyfluorfen (Goal 4F). The emulsifiable concentration of oxyfluorfen (Goal 2EC) is noted for a high level of contact burn as well as vapor drift. The newer formulation (Goal 4F) is a suspended solid with reported reductions in both vapor drift and contact burn. Oxyfluorfen has a very good record of effective weed control in many different vegetable and orchard crops in Hawaii. Ronstar WP has been shown to be very effective on weeds present at Plant Materials Center on Molokai as well as being safe on newly established transplants of pili grass (*Heteropogon contortus*) and emoloa.

Prior to this field demonstration, a study was conducted to determine the response of 2 and 4 week old emoloa seedlings grown in commercial potting mix, outdoors in green house flats (see DeFrank and Sumida). In that study, Buctril was found to be safe at both 1 and 2 pints per acre when applied to both 2 and 4 week old seedlings. Goal 4F and Ronstar WP were also applied at rates labeled to be effective for a wide range of weeds and appeared to cause little no immediate contact burn on 2 week old seedlings grown in a soilless media containing peat most and perlite. However at 14 days after spray application to 2 weeks old seedlings, foliar necrosis became much more wide spread. Overhead irrigation was applied to treatments of preemergence herbicides (i.e. Goal 4F and Ronstar 50WP) soon after herbicide application to minimize contact burn.

The field grown emoloa seedlings were treated with herbicides from a tractor mounted 20 foot boom sprayer to determine if results from the container study were consistent with similar treatments applied under field conditions. The field demonstration was conducted on Molokai at the NRCS's Plant Material Center in May 2003.

Materials and Methods

Emoloa seeds (NRCS accession # 9079729) were planted with a tractor mounted disc seeder in a two row bed on 05/05/03. Prior to seeding, the field was irrigated to stimulate weed seed germination. Weeds grew for approximately 2-3 weeks and were then sprayed with a mixture of 2 systemic contact herbicides. The preplant spray mixture consisted of 1% glyphosate (Roundup) and 1% triclopyr (Garlon 4). There were no weeds present at the time of planting. Drip irrigation was used to germinate and grow emoloa seedlings after planting.

A tractor mounted sprayer with a 20 ft. boom was calibrated to deliver 52.3 gallons per acre (GPA). A description of the treatments, applied at two ages, to emoloa seedlings is provided in [Table 1](#). The finished volume of each treatment was 10 gallons. The tractor sprayer was used to treat 30 linear feet of crop row. Herbicide sprays were applied on 05/19/03, 14 days after planting (DAP) and on 09/16/03, 42 DAP. Seedlings of a specific age were only treated once; either 14 or 42 DAP. Treatments were not replicated,

thus statistical analysis of the data collected is not provided. Visual injury ratings and digital images were recorded on 06/16/03 (28 DAS-01, 42 DAP) and 07/02/03 (16 DAS-02 and 58 DAP).

Table 1. Treatments applied to field grown emoloa seedlings with a tractor mounted sprayer. The spray was equipped with a 20 ft. boom and calibrated to apply 52.3 gallons per acre with at 40 PSI. Ten gallons of finished spray were prepared for each treatment.			
Treatment	Amount/acre	lb ai/a ^z	Amount in oz or grams / 10 gallons
1 Buctril	16 oz	.25	3.1
2 Buctril	32 oz	.50	6.2
3 Goal 4F	8 oz/a	.25	1.5
4 Goal 4F	16 oz/a	.50	3.0
5 Ronstar 50WP	4.0 lb	2.0	347 g
6 Ronstar 50WP	8.0 lb	4.0	694 g
7 Untreated			
^z lb ai/a means pounds of active ingredient per acre.			

Results

The age of emoloa seedlings made a profound difference in visual ratings of foliar injury and vigor in response to herbicide sprays. When herbicides were applied 14 DAP, severe injury and reduced vigor were recorded 28 DAS-01 for all herbicides except Buctril (see [Table 2.](#)). Buctril is labeled for use in seedling grasses grown for sod or seed for control of broadleaf weeds in the cotyledon to 2 true leaf stage. Weeds exceeding 4 inches in height are generally too large for control with Buctril. At 44 DAS-01, a recovery in vigor for emoloa treated 14 DAP was greatest in the Buctril treatments with much less recovery in the Goal and Ronstar treatments.

Herbicides applied to 42 day old seedlings caused much less foliar injury and vigor loss compared to seedlings treated at 14 DAP, [Table 2.](#) The high rate of Goal reduce vigor by 25% in visual ratings recorded 16 DAS-02. The herbicide treatments cause little to no damage to leaves of emoloa seedling treated 42 DAP.

Discussion

Weed control in seedling grasses is very challenging due to the sensitivity of most species to pre and post emergence herbicides. Prior to the start of this experiment, a finished seedbed was prepared and irrigation applied to initiate weed growth. Weeds were allowed to grow for 2-3 weeks and then killed with a contact herbicide mixture of Roundup and Garlon 4. Although Roundup is not reported to have any effect on direct seeded crops via soil adsorption, Garlon 4 may. The Garlon 4 product label indicates that at applications rates of 4 quarts/a, plantings of conifer seedlings should be delayed by at least 1 month to avoid injury due to soil uptake. When 4 to 8 quarts per acre are applied, conifer plantings should be delayed by 2 months. The stand of emoloa resulting from direct seeding was very uneven throughout the planting for this demonstration. Although ants were thought to be the main culprit that reduced stands, soil uptake of Garlon 4 may also have been a factor.

The results of this demonstration clearly show that seedling broadleaf weeds can be successfully controlled in 14 day old emoloa seedlings with an acceptable reduction in vigor. Ronstar WP and Goal 4F are not

suitable for use when applied at 14 DAP. When emoloa is at least 42 days old, all herbicides used in this experiment are safe at the rates of application described here.

In all direct seeded crops for seed production, site preparation is the most important aspect of a successful weed control program. When possible, overhead irrigation should be used to flush weeds throughout the planting, which can then be eliminated prior to planting with contact herbicides. Roundup and Garlon 4 make a good mixture for control of a wide spectrum of grass and broadleaf weeds. However, it is not clear if Garlon 4 applied prior to seeding can have a negative impact on subsequent germination and growth of emoloa. Future research should determine if Garlon 4 applied prior to direct seeding of any native species has a detrimental impact on germination or seedling vigor.

In this experiment drip irrigation was used to germinate and grow emoloa. When preemergence herbicides are applied to seedlings or new transplants, contact injury can be reduced if overhead irrigation is available to wash it off of the leaves. Future research should be conducted to determine if the safety of Ronstar WP and Goal 4F can be improved with overhead irrigation applied soon after herbicide application.

The data collected in this demonstration indicates that Buctril can be very useful in controlling small broadleaf weeds in emoloa plantings as young as 14 days old. Without overhead irrigation, preemergence applications of Ronstar WP or Goal 4F need to be delayed until plants are at least 42 days old. The data and circumstances described for this demonstration also point to future research needs to improve the weed control and safety of herbicides studied here.

Acknowledgements and Disclaimer

Trade names are used in this report for the convenience of readers and does not constitute an exclusive endorsement of the University of Hawaii, the Cooperative Extension Service, the USDA nor the Natural Resources Conservation Service (NRCS). The information contained here is not a recommendation for use. It is a violation of state and federal law to use any pesticide in manner inconsistent with its labeling.

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Table 2. Response of emoloa seedlings treated with herbicide sprays 14 and 42 days after planting. Visual injury ratings based on % of treated foliage showing necrosis or yellowing, 100% means all treated foliage showing injury. Vigor ratings based on % of maximum vigor possible at this stage of growth. A vigor rating of 100 represents the maximum vigor attainable at the time that data was recorded. Visual ratings were obtained on 06/16/03 28 days after the first spray (28 DAS-01) and on 07/02/03 (44 DAS-01 and 16 DAS-02)

Treatment	Amount/acre	Treated at 14 DAP				Treated 42 DAP	
		28 DAS-01		44 DAS-01		16 DAS-02	
		% Injury	Vigor	%Injury	Vigor	% Injury	Vigor
1 Buctril	16 oz	10	75	0	90	0	90
2 Buctril	32 oz	20	65	0	90	0	95
3 Goal 4F	8 oz/a	98	3	0	5	1	95
4 Goal 4F	16 oz/a	99	1	0	1	2	75
5 Ronstar 50WP	4.0 lb	70	45	0	40	1	95
6 Ronstar 50WP	8.0 lb	85	40	0	10	1	90
7 Untreated		0	95	0	99	0	99